

Seeking the Knowledge Edge: The Revolution in Military Affairs and its Implications for Australia¹

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Australia is now a substantially less secure country than it was five years ago. Our defence capacity is declining. Our security environment is more complex and less stable. The nations of our region are spending money on military acquisitions at an unprecedented rate – indeed, the Asia-Pacific is the fastest growing military market in the world.

Greg Sheridan, Foreign Editor, *The Australian*, 8 December 2000

In the decade since the collapse of the Soviet Union in 1991, Australian defence planners have confronted the painful reality that while strategic environments can change quickly, military force structures cannot. At the beginning of the 1990s, in the immediate post-Cold War era, most of the foundations of Australia's approach to defence planning were assailed and eroded by the fierce winds of international political change. In particular, since the late 1990s, Australian strategic planners have been confronted by what former Defence Minister, John Moore, has described as a 'sea of instability' stemming mainly from an unanticipated upsurge of insecurity in the Asia-Pacific.² This 'sea of instability' includes a fragile post-Suharto Indonesia, a mercenary outbreak in Papua New Guinea, the deployment of Australian forces to assist in the pacification of East Timor and the 'Africanisation' of South Pacific islands such as Bougainville, Fiji and the Solomons.³ To complicate matters further, Australia has now inherited an added strategic burden stemming from New Zealand's decision to abandon maintaining even a niche high-technology warfighting capability.⁴

In addition to this growth in regional uncertainty, the quickening demands of global technological modernisation and the impact of a long decline in Australian defence spending have presented Canberra with the complex task of crafting a new, more flexible and, above all, more multi-dimensional strategic policy. As a consequence, Australian defence planners have given considerable attention to the notion that there are practical benefits to be gained from acquiring selected information technologies arising out of the Revolution in Military Affairs (RMA). For many official Australian strategists, RMA

¹ The views expressed in this paper are those of the author and should not be seen as official representations of the Australian Army or of the Australian Department of Defence.

² Speech by the Hon. John Moore, Minister for Defence, 6 December 2001 as quoted in *The Australian*, 7 December 2000.

³ Ben Reilly, 'The Africanisation of the South Pacific', *Australian Journal of International Affairs*, November 2000, vol. 54, no. 3, pp. 261-9.

⁴ In May 2001 New Zealand scrapped its Skyhawk combat air capability in favour of boosting its army's peacekeeping capabilities, *The Australian*, 9 May 2001. For the consequences of not taking the RMA seriously see David Dickens, *The Revolution in Military Affairs: A New Zealand View, Part 1*, Working Paper 14/99, Centre for Strategic Studies, Victoria University of Wellington, Wellington 1999, 37-8.

developments in information technology represent one of the most important means to redesign Australia's approach to defence planning in the 21st century. Critical issues of military capability, force structure organisation and joint doctrine are seen as having at least partial solutions in the realm of RMA research and development.

This study examines Australia's official quest to exploit the RMA in order to strengthen its defence capacity. Four areas are analysed. First, by way of background, this article sketches briefly the background to the rise of RMA thinking in Australia between 1994 and 1997. Second, the manner in which RMA thinking was institutionalised in Australian strategic thought in 1997 is outlined. Between 1997 and 2000, an indigenous concept of an information-based military revolution – called the Knowledge Edge – was developed by strategists within the Australian Department of Defence. The various measures introduced into Australian strategic policy under the Knowledge Edge concept are assessed.

Third, the essay examines the significance of the December 2000 Defence White Paper in the Australian process of exploiting selected information-age technologies to achieve a Knowledge Edge. Fourth and finally, the paper assesses some of the major institutional challenges confronting Australia's quest to redesign its armed forces around RMA ideas and technologies by the second decade of the 21st century.

The Background to Australia and the RMA: The Era of Informal Debate, 1994-97

The Australian Defence Organisation (ADO) did not adopt RMA thinking into its official defence policy until the end of 1997.⁵ The early years of the Australian RMA debate – the era of informal 'first-phase theorising' – have been outlined in considerable detail elsewhere.⁶ It is useful, nonetheless, to summarise the main features the Australian RMA approach in order to understand its character.

Between 1994 and 1997, the Australian RMA debate was largely the work of uniformed officers in the services and of defence scientists who were concerned with analysing future warfare. Consequently, Australian examination of RMA developments tended to be singular and informal, rather than joint and institutional, in approach. Early RMA theorists included Colonel (now Major General) Peter Leahy, Brigadier (now Major General) Peter Dunn, Air Vice Marshal Peter Nicholson and scientists such as Dr Richard Brabin-Smith (formerly Chief Defence Scientist and now Deputy Secretary for Strategy).⁷ The early theorists concentrated on analysing the potential benefits of information technology in overcoming the problem of defending Australia – a country covering 12 per cent of the earth's surface but containing only 1 percent of the earth's population. To put this task into context, it should never be forgotten that Australia's northern frontier extends for the same distance as that between London and Beirut.

⁵ The Australian Defence Organisation is composed of two components, the Department of Defence and the Australian Defence Force.

⁶ See Michael Evans, 'The Middle Way: Australia's Response to the Revolution in Military Affairs', *National Security Studies Quarterly*, Winter 2000, vol. vi, issue 1, pp. 1-19 and *Australia and the Revolution in Military Affairs: The Challenge for a Middle Power*, Working Paper, Pentagon Study Group on Japan and NE Asia, Japan Information Access Project, Washington DC, 24 July 2000.

⁷ *Ibid.*

The first-phase theorists focused on the roles of command, control, communications, computers and intelligence (C4I), and command and control warfare (C2W). By 1996 there was a general consensus amongst senior uniformed professionals such as Leahy, Dunn and Nicholson that Australian Defence Force (ADF) operations would have to be transformed, as the technological changes of information-age warfare became more apparent.⁸ A 1996 paper by Air Vice Marshal Peter Nicholson, Air Commander, Australia, saw the key to an Australian RMA response as lying in sensor suites and data fusion that gave improved situational awareness in operations. Nicholson called his approach to the RMA one of 'knowledge dominance' – an idea that was subsequently to assume great importance in official Australian defence circles.⁹

The views of the uniformed theorists were supported by the then Chief Defence Scientist, Dr Brabin-Smith, who argued that Australia stood to benefit in the early 21st century from emergent technologies in ISR (information, surveillance and reconnaissance) communications, C2 (command and control) and precision strike.¹⁰ A significant practical development in the RMA debate was the decision by the Defence Science and Technology Organisation (DSTO) in 1996 to launch the Takara Program – a scheme aimed at delivering a viable and integrated C3I (command, control, communications and intelligence) capability to the ADF for operations on the battlespace of the future.¹¹

Australian thinking on the importance of the RMA was also strongly influenced by exposure to US experimentation. Australian analysts studied programs such as the US Army's Force XXI scheme, its Advanced Warfighting Exercises (AWEs), its digitisation program and its use of battle laboratories. In addition, joint American-Australian military exercises under US Pacific Command (PACOM) demonstrated the use of C4I and battlespace detection systems in improving the speed and efficiency of military decision-cycles.¹²

A decisive event in the development of an official Australian RMA initiative was the election in March 1996 of a Liberal-National Coalition Government led by John Howard. Under Minister for Defence, Ian McLachlan, the new administration demonstrated an early interest in the possibilities of RMA technology. In June 1996, McLachlan argued that the long-term changes in information technology would be as profound for military organisations in the 21st century as the coming of the internal-combustion engine in the early 20th century.¹³ He identified the RMA's key components as being fourfold: lethality of weapons; projecting force over increased distances; speed of information

⁸ Evans, 'The Middle Way: Australia's Response to the Revolution in Military Affairs', pp. 2-8.

⁹ Air Vice Marshal P. G. Nicholson, 'Operating the RAAF Beyond 2000', in Alan Stephens, ed, *New Era Security: The RAAF in the Next Twenty-Five Years*, Air Power Studies Centre, Canberra, 1996, pp. 249-64.

¹⁰ Richard Brabin-Smith, 'The Impact of Emerging Technologies', in J. Mohan Malik, ed, *The Future Battlefield*, Deakin University Press in association with the Directorate of Army Research and Analysis, Melbourne, 1997, pp. 139-50.

¹¹ Dr Jason Scholz, 'DSTO and the Australian RMA Initiative', Presentation at the Australian Defence Organisation Revolution in Military Affairs Seminar, 8-9 November 1999. Copy in author's possession. See also Evans, 'The Middle Way: Australia's Response to the Revolution in Military Affairs', p. 5.

¹² Evans, 'The Middle Way: Australia's Response to the Revolution in Military Affairs', pp. 6-7 and Lieutenant Colonel G. T. Peterson, 'The Impact of the Revolution in Military Affairs on the Australian Defence Force', *Yolla: Journal of the Joint Services Staff College Association*, October 1996, IV, i, fn 16.

¹³ The Hon. I. M. McLachlan, 'Defence Challenges in New Era Security', in Stephens, *New Era Security*, pp. 3-8.

processing; and growing capacities for intelligence gathering.¹⁴ The Minister pointed to other benefits such as the potential of unmanned aerial vehicles (UAVs) and increased interoperability with allies. He warned, however, that Australia had to be 'careful to pick only those parts of RMA technology that address our needs'.¹⁵

By the end of 1996, Australian-American cooperation on the RMA increased dramatically. Australian defence strategists became immersed in the full range of American ideas on information warfare. These ideas included Admiral William A. Owens's theory of the 'emerging systems of systems'; notions of battlespace awareness and dominant manoeuvre; precision strike, sensor-to-shooter links and simultaneity; the potential of joint direct-attack munitions (JDAM), global positioning systems (GPS) and brilliant sub-munitions.¹⁶ From 1996 onward, American future warfare specialists from the Office of Net Assessment (ONA), the Centre for Strategic and Budgetary Analysis (CSBA) and the American war colleges became regular visitors to Australia.

In early 1997, Andrew Marshall, the distinguished American strategic thinker and Director of Net Assessment, pointed out that Australia stood to benefit from several RMA developments. He singled out automated combat systems, long-range precision-strike, stealth and sensor technology as new techniques that would permit control of Australia's huge northern sea-air gap in a way not possible before. Marshall also thought that the US Marine Corps concept of *Sea Dragon* - in which small units operated with logistics and firepower from a distance - might be a useful model for Australia to emulate in terms of projecting power in the future.¹⁷ Significantly, from the beginning of 1997, ONA consultants became influential in helping to mould the Department of Defence's institutional approach to the RMA debate.

Australia's Institutional Embrace of the RMA, 1997-2000

In December 1997, a new defence review, *Australia's Strategic Policy, 1997* (ASP 97) became the first official document to acknowledge the potential of the RMA in helping Australia to shape its future strategic environment.¹⁸ ASP 97 argued that the application of information technology within the ADF would permit more cost-effectiveness in force structure through 'exploiting technology, doctrine and geography'.¹⁹ The review went on to state:

For Australia it [the RMA] has particular significance. Not only will new technology provide military personnel with an expansive breadth and depth of information about the battlefield, but sophisticated strike weapons will give

¹⁴ *Ibid.*, p. 4.

¹⁵ *Ibid.*, p 4-5.

¹⁶ For the impact of American ideas see the proceedings of the first Australian RMA conference in Keith Thomas, ed, *The Revolution in Military Affairs: Warfare in the Information Age*, Australian Defence Studies Centre, Canberra, 1997.

¹⁷ Andrew Marshall, 'Introduction', in Thomas, *The Revolution in Military Affairs*, pp. 3-5.

¹⁸ Commonwealth of Australia. *Australia's Strategic Policy 1997*, Directorate of Publishing and Visual Communications, Canberra, 1997.

¹⁹ *Ibid.*, p. 55.

advanced forces the capability to destroy targets with an unparalleled degree of precision and effectiveness.²⁰

Mastery of information technology would be an area where the small, 50,000 strong ADF could aspire to continuing excellence.²¹ Australia's highest capability priority in the future was described as being the achievement of a Knowledge Edge. The Knowledge Edge construct was an apparent refinement of Air Vice Marshal Nicholson's earlier concept of 'knowledge dominance' and reflected the research work of the DSTO.²² The Knowledge Edge was defined in ASP 97 as 'the effective exploitation of information technologies to allow us to use our relatively small force to maximum effectiveness'.²³

Exploiting information-age technology to achieve a Knowledge Edge was seen as holding out three important strategic advantages for Australia. First, information capabilities offered the possibility of greatly improved surveillance of Australia's vast maritime approaches. Second, information technology – when applied to the command, positioning and targeting of forces – would enable military deployment to maximum effect. Information technology offered a means of mastering Australia's geography.²⁴

Third, through its strong assets in domestic information technology and its alliance with the US, the ADF could look forward to creating a defence architecture that integrated the three elements of capability: intelligence, command and its supporting systems including communications and surveillance.²⁵ ASP 97 foresaw sensors, platforms, space-based surveillance, long-range UAVs, over-the horizon-radar (OTHR) and airborne early warning and control aircraft (AEW&C) being meshed – with American assistance – into an overall system to provide comprehensive real-time information to the ADF in the field.²⁶

The Office of the RMA and the Futures Directorates: The Establishment of Australia's Future Warfare Organisation

During 1998 and 1999, the Howard Government introduced several further measures in order to support an Australian RMA effort. Spending by the DSTO on RMA-related research and development into C4, ISR and EW was increased by A\$10 million. In addition, military cooperation with the US Army's battle laboratories was extended.²⁷ However, the Government's most important measure was the decision in April 1999, to create the Office of the Revolution in Military Affairs (ORMA) in the Military Strategy

²⁰ *Ibid.*

²¹ *Ibid.*

²² For the development of Nicholson's ideas on knowledge dominance see, Air Vice Marshal Peter Nicholson, *Controlling Australia's Information Environment or Decision Superiority and War-Fighting*, Paper Number 65, Air Power Studies Centre, Canberra, June 1998. The DSTO's Electronics and Surveillance Research Laboratory also carried out important work on the Knowledge Edge in 1996 and 1997.

²³ *Australia's Strategic Policy 1997*, p. 56.

²⁴ *Ibid.*

²⁵ *Ibid.*, pp. 56-60.

²⁶ *Ibid.*, p. 57. For an analysis of the implications of the Knowledge Edge see Paul Dibb, 'The Relevance of the Knowledge Edge', *Australian Defence Force Journal*, no. 134, January/February 1999, pp. 37-48.

²⁷ Australian Defence Headquarters, Military Strategy Branch (Office of the RMA), Minute, 'Public Discussion Paper – 'The Revolution in Military Affairs and the Australian Defence Force'', 16 September 1999, p. 1.

Branch of Australian Defence Headquarters (ADHQ). The formation of a dedicated RMA organisation in the heart of Australia's defence machinery ensured that what has been called 'second phase' theorising on information-age warfare would be more formalised, institutional and, above all, more triservice in approach.²⁸

The ORMA was to be headed by the ADF Director General of Military Strategy, a one-star officer, who was to report directly to the Secretary of Defence and the Chief of the Defence Force (CDF) and through them to the Minister.²⁹ The main objective of the new organisation was to extract 'the maximum value from the RMA for the ADF – be it in equipment acquisition and development, training, doctrine development or alliance relations'.³⁰ In particular, the ORMA was to seek to identify those aspects of technological change that were most likely to affect major long-term capabilities.

The ORMA became responsible for coordinating three important tasks. First, in close cooperation with the United States, the Office was charged with developing an implementation strategy for adapting selected aspects of RMA technology to Australia's circumstances. Second, the new organisation was to identify and analyse future warfare concepts that could be used to incorporate organisational, doctrinal and technological changes into the current ADF. Third, the ORMA was to prepare for the Minister of Defence a paper on the ADF and the implications of information-age technology that explored policy options and alternatives.³¹

Parallel to the formation of the ORMA, the single services refined their input into the environmental specialties of information-age conflict. Dedicated future warfare directorates were formed in the Army, the RAAF and the RAN to facilitate wider collaboration and cross-pollination in research.³² In the land environment, the Australian Army's Future Land Warfare Directorate (FLWD) was created in 1999 to examine future land warfare trends out to 2030 based on a 'concept-led, capability-based' philosophy involving network-centric warfare and battlespace synchronised operations.³³ Similarly, in the RAAF, Project Oracle 2030 was created to try to 'pre-adapt the RAAF' for 21st century operations by examining such approaches as effects-based operations (EBO).³⁴ During 2000, the RAN created a Strategy and Futures Directorate to try to fuse together blue-water responsibilities with the growing need in the 21st century for integrated operations in the littoral using network-enabled operations and UAVs.³⁵

²⁸ Evans, 'The Middle Way: Australia's Response to the Revolution in Military Affairs', pp. 11-12.

²⁹ The first Head of the ORMA was Brigadier S. H. Ayling. In June 2001 he was succeeded by Air Commodore John N. Blackburn.

³⁰ Brigadier S. H. Ayling, Office of the RMA, 'Foreword', *Australian Defence Force Journal*, no. 144, September/October, 2000, p. 2.

³¹ Australian Defence Headquarters, Military Strategy Branch (Office of the RMA) Minute, 'Public Discussion Paper – "The Revolution in Military Affairs and the Australian Defence Force"', 16 September 1999.

³² For background to the services' futures directorates see Air Commodore John N. Blackburn, AM, Director General Policy and Planning – Air Force, Commodore Lee Cordner, Director General Navy Strategic Policy and Futures and Brigadier Michael A. Swan, "'Not the Size of the Dog in the Fight": RMA – The ADF Application', *Australian Defence Force Journal*, no. 144, September/October 2000, pp. 65-9.

³³ See Australian Army, *Land Warfare Doctrine 1, The Fundamentals of Land Warfare*, Combined Arms Training and Development Centre, Sydney, 1999, chapter 6; *The Army Continuous Modernisation Plan, 1999-2004*. Draft as at 12 July 1999, pp. 8-17.

³⁴ Blackburn, Cordner and Swan, "'Not the Size of the Dog in the Fight": RMA – the ADF Application', p. 68.

³⁵ *Ibid.*

Between 1999 and early 2000, the formation of the ORMA and the creation of the dedicated single service future warfare directorates did much to establish an institutional framework for the disciplined analysis of RMA concepts. The ORMA and the futures directorates also contributed decisively to the notion that there was an affordable way for Australia to absorb and benefit from the rigorous challenges arising from warfare in the information age.

Project Sphinx: Australia's Methodological Approach to the RMA and Future Warfare

Between 1999 and 2000, the ORMA developed a methodological strategy for an Australian approach to information-age warfare called Project Sphinx. The project also served to provide Australia with a coordination mechanism to develop concepts for the ADF to meet the needs of warfare in the information age.³⁶

To date, Sphinx has sought to provide a collaborative methodology to analyse RMA developments. The focus of the project has been on identifying conceptual issues related to capability and doctrinal usage thus providing a firm intellectual foundation for research and development (R&D) into RMA-style technology.³⁷ The overall objective is to use Sphinx to help create what is described as a strategic-level Enterprise Architecture Model within the ADO that unites policy, operations, systems and technical processes. Sphinx is seen as the vehicle by which it may be possible to identify the most plausible future warfare concepts and to assess their possible long-term capability investment implications for Australia through to the year 2025.³⁸

Central to Australia's Sphinx methodology are three strategic propositions. First, the Asia-Pacific region is regarded as central to Australia's security. Second, there is firm Australian belief that the information age has ushered in a new era in warfare. Third, there is a general strategic conviction that the post-Cold War security environment is peculiarly volatile and extremely difficult to predict.³⁹ So far, Project Sphinx has attempted to grapple with the problem of identifying and exploring future warfare concepts and their capability consequences by employing three processes: *concept generation*, *concept evaluation* and *concept consultation*. Concept generation was originally facilitated by the formation of Concept Initiation Teams (CITs). These teams – drawn from wide expertise throughout the Department of Defence – provide a means to assess the impact of emergent information-age warfare techniques.⁴⁰

Throughout 1999 and 2000, CITs examined various categories of future warfare in information-age conditions. These categories included ISR, C2 and adaptive interoperability, tailored effects (or precision firepower), force projection, force

³⁶ Australian Defence Headquarters, Strategic Policy and Plans Division, 'Project Sphinx', Briefing Paper by Air Vice Marshal P. G. Nicholson, Head, Strategic Policy and Plans Division, 7 April 1999. Document in author's possession.

³⁷ *Ibid.*, p. 1.

³⁸ Australian Defence Headquarters, Vice Chief of the Defence Force, 'Capability Executive Meeting 10 December 1999: Outcomes', pp. 2-3. Document in author's possession.

³⁹ Brigadier S. H. Ayling, 'Future Warfare Concepts: Designing the Future Defence Force', *Australian Defence Force Journal*, no. 144, September/October 2000, p. 6.

⁴⁰ *Ibid.*

protection and force sustainment. The aim of each team was to refine concepts that could serve as potential pathways to guide future ADF capability planning and force structure.⁴¹ In 2000, in order to link concept development to capability assessment, a Military Systems Experimentation Branch (MSEB) was created within the DSTO.⁴²

The second process in the Sphinx program has been concept evaluation, mainly through the use of campaign wargames known as the Krait strategic seminar series. Strategic wargaming was introduced into the Australian Defence Organisation in order to evaluate the feasibility of future warfare concepts in various conflict scenarios that might emerge in the first quarter of the 21st century. The Krait process has been viewed as important in testing the various warfare concepts in order to establish which ones offer the best possibilities for exploiting military advantage in future joint, combined and coalition operations planning. The ORMA believes that wargaming will eventually be accepted as an important intellectual exercise in the Australian capability development process.⁴³ Between 1999 and 2000, however, Australian wargaming relied heavily on American rather than indigenous expertise.⁴⁴ The ADO contracted consultants drawn from US organisations such as the CSBA and the Science Applications International Organisation (SAIC).⁴⁵ Australian defence planners regarded the CSBA's experience in conducting the 20XX Series of futuristic wargames for the US Office of Net Assessments as being particularly valuable.

Most recently, in January 2000, the Military Strategy Branch established a liaison position with US Joint Forces Command (USJFCOM) for collaboration in future warfare experimentation. The objective of this relationship was to 'provide a specialist liaison and representation link between the ADO and USJFCOM on issues related to the RMA'. Important emphasis was placed on C4ISR work, operational procedures such as effects-based operations and RMA wargames.⁴⁶

Using largely CSBA methods, Krait wargames have modelled several Asia-Pacific conflict scenarios, ranging from major war through regional coalition operations to the unilateral use of Australian forces in a 'failed-state'.⁴⁷ In 1999 and 2000 Krait wargames also tested future warfare concepts such as force projection and force protection, ISR, command and control, and force sustainment; tailored effects, and special operations. The most recent Krait seminar has involved a workshop on developing a Joint Warfighting Concept for the ADF in information-age conditions. The Krait process is supported by

⁴¹ *Ibid.*, pp. 6-7.

⁴² Author's notes at Australian Department of Defence, RMA Working Group meeting, 30 June 2000. The MSEB was to become operational in 2001.

⁴³ Department of Defence, Australian Defence Headquarters, Brief for HSPP, 'Project Sphinx: Concept Initiation Teams', 3 May 1999 and 'Concept for the Krait Series of Wargames', June 1999; Ayling, 'Future Warfare Concepts: Designing the Future Defence Force', p. 7.

⁴⁴ Department of Defence, Directorate of Future Warfare Discussion Paper No. 1, 'Project Sphinx: Military Challenges and Warfare Concepts for the ADF in 2025', no date but clearly early 1999, pp. 1-8. Document in author's possession.

⁴⁵ 'Concept for the Krait Series of Future Wargames', p. 2.

⁴⁶ Department of Defence, Military Strategy Branch, 'Terms of Reference: ADF Liaison Officer Placement with USJFCOM', January 2000, pp. 1-3; Australian Liaison Officer US Joint Forces Command. Minute, 'Weekly Activity Report, Appendix: Concept Summary: Effects-Based Operations', 26 July 2000. Documents in author's possession.

⁴⁷ 'Concept for Krait Series of Future Wargames', pp. 6-7.

another series called Taipan, that concentrate on refining campaign concepts and force structure analysis.⁴⁸

The third process in Project Sphinx, the process of concept consultation, was facilitated by the creation in August 1999 of an RMA Working Group. The latter was formed by drawing on the intellectual resources of the Department of Defence, academics and industry to help refine Australia's future warfare concepts. The initial RMA Working Group included an eclectic collection of policy makers, defence analysts, research scientists, uniformed professionals, academic consultants and representatives from private industry. During 1999 and 2000, the activities of members of the group spanned conferences, seminars and informal meetings.⁴⁹

The activities of the RMA Working Group were at least partly responsible for the spread of the notion amongst both military practitioners and defence scholars that Australia stood to benefit from the long-term implications of an RMA. As a former Chief of the Defence Force, General John Baker, told one audience, 'Australia is one of the relatively few nations with the education, scientific, industrial, attitudinal and geographic assets to make best use of RMA possibilities'.⁵⁰ Similarly, the veteran Australian strategic thinker, Professor Coral Bell, observed 'the Revolution in Military Affairs offers the most promising set of systems yet evolved to solve Australia's permanent strategic dilemma: how to defend a very large territory and a long and vulnerable coastline with forces which will always remain very small by global or regional standards'.⁵¹

In broad terms, Project Sphinx has done much to make Australian RMA thinking the most advanced in the Asia-Pacific region. Nowhere was this reality more clearly demonstrated than at a major international conference in Canberra in May 2000 entitled, 'The RMA in the Asia-Pacific: Challenge and Response'. The conference, initiated by the ORMA and the Australian Defence Studies Centre at the Australian Defence Force Academy, attracted over 200 delegates from Australasia, Europe, the Asia-Pacific and North America. The keynote speaker was Dr Andrew Krepinevich, the Director of the CSBA in the United States.⁵²

During the proceedings there was clear evidence, if not of a 'knowledge edge' then certainly of a 'knowledge gap', between Australian defence analysts and most of their Asia-Pacific counterparts. Australian speakers at the conference talked about a future battlespace environment in which network-enabled synchronised operations, tailored effects, cyber-maneuver and joint warfighting would predominate.⁵³ In contrast, most Asian speakers stressed the marginal position that the RMA held in their current strategic

⁴⁸ Ayling, 'Future Warfare Concepts: Designing the Future Defence Force', p. 8. .

⁴⁹ *Ibid.*

⁵⁰ General John Baker, AC, DSM, (Rtd), 'Australia's Defence Posture', *Australian Defence Force Journal*, no. 143, July/August 2000, p. 16

⁵¹ Coral Bell, 'Security Regionalisation and the Future of the Australian Defence Forces', *Australian Defence Force Journal*, no. 143, July/August 2000, p. 21.

⁵² The proceedings of the conference are contained in a special edition of *Australian Defence Force Journal*, vol. 44, September/October 2000.

⁵³ Blackburn, Corder and Swan, '"Not the Size of the Dog in the Fight": RMA – The ADF Application, pp. 65-9 and Jason B. Scholtz, 'Networked-Enabled Force Synchronisation', in *Australian Defence Force Journal*, no. 144, September/October 2000, pp. 70-77.

thinking. The Malaysian scholar, J. N. Mak, summed up the position of many Asia-Pacific strategic analysts when he pointed out that, with the exception of Singapore, the conditions for an RMA in South-East Asia did not exist.⁵⁴

Mak conceded that, while there was considerable expenditure on conventional arms, this development was related mainly to changing international dynamics and the needs of internal security rather than being the product of a conscious drive towards military modernisation.⁵⁵ He stated:

The RMA is of minimal utility today to South-East Asia . . . there are no conscious attempts in the region to work towards a Revolution in Military Affairs. This is because the RMA is still a little irrelevant to the needs of the sub-region. Regime security still remains the primary paradigm for South-East Asia'.⁵⁶

In terms of theory, if not yet capabilities, there is little doubt that Australia has already achieved a substantial 'knowledge edge' in South-East Asia. Only Singapore would appear to have any potential to match Australia in RMA thinking.⁵⁷

Towards an Australian RMA: Developing the Knowledge Edge, 1999-2001

Between the end of 1999 and the beginning of 2001, the Australian Defence Organisation concentrated on developing the concept of a Knowledge Edge as the centrepiece of an Australian RMA. Between late 1999 and the beginning of 2001, a series of official reports, discussion papers and briefings were produced examining the implications of an information-based military revolution. In December 2000, a Defence White Paper confirmed the concept of the Knowledge Edge as being at the heart of Australia's defence planning in the first decade of the 21st century.

The RMA Paper, Defence Review 2000 and the Knowledge Staff

In November 1999, the ADF's Military Strategy Branch defined a revolution in military affairs as comprising 'fundamental changes in the conduct of military operations resulting from innovative use of technologies, concepts and organisations in response to political, economic, security and social uncertainty'.⁵⁸ Such a holistic definition placed a premium on outlining an integrated approach to an Australian RMA. As Brigadier S. H. Ayling, Director General Military Strategy, put it in May 2000, '[it is] the combination of organisation, doctrine and technology that leads to a superior military capability'.⁵⁹

⁵⁴ J. N. Mak, 'The RMA in South-East Asia: Security and External Defence', *Australian Defence Force Journal*, no. 144, September/October 2000, pp. 31-35.

⁵⁵ *Ibid.*, pp. 31-35.

⁵⁶ *Ibid.*, p. 31.

⁵⁷ Lieutenant-Colonel Hugh Lim, Singapore Armed Forces, 'Impact of RMA on Command and Control – An SAF Perspective', *Australian Defence Force Journal*, no. 144, September/October 2000, pp. 21-6.

⁵⁸ Brigadier S. H. Ayling, 'The Implications of the Revolution in Military Affairs', Presentation at the Australian Defence Organisation Revolution in Military Affairs (RMA) Seminar, Russell Offices, Canberra, 8 November 1999. Copy in author's possession.

⁵⁹ Ayling, 'Future Warfare Concepts: Designing the Future Defence Force', p. 6.

Between late 1999 and early 2000 there was a systematic attempt to come to terms with the multi-dimensional demands of the RMA through the Military Strategy Branch's preparation of a major paper entitled, 'The Revolution in Military Affairs and the Australian Defence Force'.⁶⁰ This official document attempted to map the direction of a distinctly Australian approach to an RMA and began the process of explaining the strategic significance of achieving a Knowledge Edge. 'The Revolution in Military Affairs and the Australian Defence Force' was originally conceived for release as a public discussion paper during 2000. Although a final version of the paper was completed and even quoted in the media, ultimately the document was not released for public debate.⁶¹

The official RMA paper called for a specifically Australian approach to the emergent information-based RMA.⁶² Such an approach needed to be based on a judicious mixture of enabling technologies, upgraded platforms, appropriate organisational change and new military doctrine.⁶³ C4ISR technologies, integrated logistics support (ILS) and information operations (IO) were identified as central to the ADF's ability to undertake effective joint and combined operations in the 21st century.⁶⁴ The problem of maintaining interoperability with the United States while maintaining an ability to be able to undertake independent operations in the Asia-Pacific region was also emphasised.⁶⁵

Several of the central ideas in the ORMA paper were subsequently reflected in *Defence Review 2000 – Our Future Defence Force: A Public Discussion Paper*, an official publication released in June 2000.⁶⁶ The document was published as a companion document to the work of a Community Consultation Team headed by former Foreign Minister and Ambassador to the United States, Andrew Peacock. The aim of *Defence Review 2000* was twofold. First, it was hoped that the document would assist the Community Consultation Team in gauging public opinion on strategic issues at a time when, because of the deployment of elements of the ADF to East Timor, defence policy had achieved a high national profile. Second, the consultation exercise was intended to help Australian policy planners engaged in drawing up the first Defence White Paper of the 21st century to focus on strategic areas and budget issues that were revealed as being of public concern.

Significantly, the report of the Community Consultation Team found that 'there was widespread agreement that Australia should maintain the knowledge edge in intelligence, surveillance and reconnaissance capabilities'.⁶⁷ This finding coincided with a basic

⁶⁰ Department of Defence, Military Strategy Branch, 'The Revolution in Military Affairs and the Australian Defence Force: A Public Discussion Paper' (Second Draft), December 1999. Copy in author's possession.

⁶¹ See for example the editorial in *The Australian* newspaper, 4 January 2000 on the discussion paper.. The document was sidelined by the Government's decision in early 2000 to proceed with a broader public discussion paper on the future of Australian defence policy that incorporated aspects of the RMA.

⁶² 'The Revolution in Military Affairs and the Australian Defence Force: A Public Discussion Paper', pp. 1-2; 4-1.

⁶³ *Ibid.*, 1-2.

⁶⁴ *Ibid.*, pp. 3-1-7.

⁶⁵ *Ibid.*, p. 4-8.

⁶⁶ Department of Defence, *Defence Review 2000 – Our Future Defence Force: A Public Discussion Paper*, Defence Publishing Service, Canberra, June 2000.

⁶⁷ Department of Defence, *Australian Perspectives on Defence: Report of the Community Consultation Team*, September 2000, pp. 6-7. The Community Consultation Team held twenty-eight public meetings, surveyed 2000 people and accepted 1157 submissions.

premise of *Defence Review 2000* that, in the 21st century, the Australian military would rely increasingly on two features: information technology systems – especially ISR and C2 capabilities – and the skills of highly trained military personnel.⁶⁸

Defence Review 2000 extended ideas first mooted in ASP 97 and the ORMA paper. The document suggested that the importance of information technology would grow for Australia for two reasons. First, the trend towards the modernisation of military capabilities in the Asia-Pacific showed no signs of abating. The discussion paper pointed out that the numbers of various advanced combat aircraft, anti-ship missile and surface-to-air missile systems and electronic warfare capacities had dramatically risen in the region during the 1990s.⁶⁹

As a result, Australia's traditional advantage in maritime and air platforms was gradually being eroded. The RAAF's seventy-one F/A-18 Hornet tactical fighters were gradually losing parity with the best regional air forces. Upgrades in avionics, electronic warfare and missiles to Australia's F/A-18s and to its F-111 strike bombers, along with the acquisition of AEW&C aircraft, were critical to regaining air-combat parity.⁷⁰

The emphasis on aircraft upgrades and improved avionics in *Defence Review 2000* highlighted the second reason why information technology was vital to Australia's security: most of the ADF's major air-sea platforms were facing block obsolescence between 2007 and 2020. The discussion paper pointed out that by 2015 the list of platforms at the end of their service cycle would include the RAAF's F/A-18 Hornet, the P-3C Orion maritime patrol aircraft and C130 H transport fleet; the RAN's guided missile frigates (FFGs), its amphibious support and afloat support ships; and many of the Army's wheeled vehicles. In addition, by 2020, Australia's F-111 bombers, described as 'the muscle of our strike force', would have reached the end of their operational effectiveness.⁷¹

Australia thus faced a huge financial burden to reequip the ADF for 21st century military operations. Between 2000 and 2020, the sum required for new investment was estimated by the discussion paper as between A\$80 and 100 billion – a sum that exceeded current levels for investment by almost fifty per cent.⁷² The most critical investment challenge was in the realm of aerospace combat power. A suitable replacement fighter for the F/18-Hornet would cost at least A\$10 billion.⁷³

In the light of the twin challenges of growing regional military capabilities and an ADF heading towards obsolescence, *Defence Review 2000* reinforced the importance of the

⁶⁸ *Defence Review 2000*, p. 46.

⁶⁹ *Ibid.*, p. 14. For good analyses of Asian military modernisation see Paul Dibb, 'Defence Force Modernisation in Asia: Towards 2000 and Beyond', *Contemporary Southeast Asia*, March 1997, vol. 18, no. 4, pp. 347-60 and 'The Revolution in Military Affairs and Asian Security', *Survival*, Winter 1997-98, vol. 39, no. 4, pp. 93-116. Dibb views Singapore, China and Japan as the only three Asian states with a significant RMA potential.

⁷⁰ *Defence Review 2000*, pp. 36-9.

⁷¹ *Ibid.*, pp. 36; 37-9; 54. The discussion paper set out the ADF's current capabilities in a companion document, Department of Defence, *The Australian Defence Force: Capability Fact Book*, Defence Publishing Service, Canberra, June 2000.

⁷² *Defence Review 2000.*, p. 54.

⁷³ *Ibid.*, p. 55.

Knowledge Edge in giving Australia ‘a critical military capability edge’ in the future.⁷⁴ In terms of re-equipping the Australian Defence Force, the paper announced that ‘the application of technology associated with the “Revolution in Military Affairs” . . . may present innovative capability solutions that could yield financial savings’.⁷⁵

The discussion paper suggested that an RMA-style approach to defence modernisation was now vital for Australia. ‘Information capabilities’, the document stated, ‘are about applying the ideas of the knowledge economy to the business of fighting wars’.⁷⁶ The most critical ADF assets in the future would lie not simply in the power of platforms and weapons, but increasingly in the integration of systems and skills to produce combat effects. The document went on to observe:

Information warfare . . . the ‘Revolution in Military Affairs’ . . . is where our comparative advantage over potential adversaries is likely to last longest. In coming years, it will be harder for Australia to match regional numbers of platforms such as ships and aircraft, but we are well-placed to keep a lead in our ability to use what we have to the best effect.⁷⁷

In order to exploit sophisticated information age capabilities, the Australian-American alliance was of fundamental importance. The Peacock Review reaffirmed that, ‘our alliance with the US, which leads the world in these [information capabilities] areas, is vital to giving us affordable access to this technology’.⁷⁸

Alongside the RMA content in the public discussion paper, ADF Headquarters continued to refine the concept of the Knowledge Edge as ‘a fundamental basis for the achievement of warfighting superiority for the ADF in the Asia Pacific Region’.⁷⁹ In June 2000, a concept paper drawn up by ADF Headquarters extended the definition of the Knowledge Edge:

*A Knowledge Edge exists when, as a result of leveraging and exploiting information, communications and other technologies, and by the application of human cognition, reasoning and innovation, there is a comparative advantage in those factors that influence decision making and its effective execution.*⁸⁰

Attaining decision superiority over opponents was described as the central advantage to be gained from RMA-style technologies. The key to achieving a Knowledge Edge lay therefore in a skilful combination of command and control, information, surveillance, reconnaissance and electronic warfare (C4ISREW) capabilities. With an infrastructure based on this suite of capabilities, Australia could eventually move towards ‘a “network

⁷⁴ Defence Review 2000, p. 46.

⁷⁵ *Ibid.*, p. 54.

⁷⁶ *Ibid.*, pp. x; 47.

⁷⁷ *Ibid.*, p. 46.

⁷⁸ *Ibid.*

⁷⁹ Department of Defence, Australian Defence Headquarters, “Brief for Vice Chief of the Defence Force on the Knowledge Edge”, 22 June 2000, p. 1. Document in author’s possession.

⁸⁰ *Ibid.*, p. 1. Emphases in original.

enabled” approach to warfighting, leveraging the connectivity between sensors, commanders and weapon systems’.⁸¹

As C4ISREW capabilities provided improved connectivity in network-enabled military operations, there would have to be corresponding changes in the non-technological areas of Knowledge Edge activity. The latter included developing suitable doctrine for joint and combined operations; reforming both military organisation and military education; realigning leadership and command authority to meet information-age requirements; and maintaining suitable cohesion and morale within the ADF.⁸² A Recent draft of the ADF’s capstone doctrine lists the Knowledge Edge as one of the five ‘Australian Characteristics of Warfare’.⁸³

By mid-2001 the Department of Defence had formed a Knowledge Staff headed by a Chief Knowledge Officer, Air Vice Marshal Peter Nicholson. As noted earlier, Nicholson was an early proponent of ‘knowledge dominance’ forming a central feature of an Australian RMA. The main tasks of the current Knowledge Staff are to examine complex technical issues such as interoperability with allies and the coordination of simulation exercises. A Directorate of Intelligence, Surveillance, Reconnaissance and Electronic Warfare (DISREW) within the Knowledge Staff has the responsibility of developing an integrated national surveillance system using sensors, platforms and synthetic aperture radar.⁸⁴

The 2000 Defence White Paper and the Knowledge Edge

In December 2000, the publication of a new White Paper, *Defence 2000: Our Future Defence Force*, provided the most detailed rationale so far advanced by Canberra’s strategic planners for Australia’s embrace of the Knowledge Edge. In terms of the RMA, the 2000 White Paper represented the culmination of thinking that had begun in ASP 97. The new strategic blueprint reflected over three years of close analysis of both technological innovation and of the potential for revolutionary changes in the character of warfare. As one observer has noted, ‘the White Paper acknowledges the overriding importance of the Revolution in Military Affairs at all levels of the ADF’.⁸⁵ The document contained both a general assessment of the RMA and a specific analysis of Australia’s requirements from it in order to maximise the Knowledge Edge.

The White Paper reconfirmed the central Australian conviction that the Revolution in Military Affairs was firmly based on a global information-technology revolution. The

⁸¹ *Ibid.*, p. 2.

⁸² *Ibid.*, pp. 3-4

⁸³ Department of Defence, Australian Defence Force Publication (ADFP), Draft dated October 2000, ADFP 1, *Foundations of Australian Doctrine*, pp. 5-3-5-4. Document in author’s possession. The other four characteristics are Manoeuvre, Cooperation in Military Operations, Versatility and Flexibility in Military Operations and Justifiable Action.

⁸⁴ Department of Defence, Australian Defence Headquarters, ‘The Knowledge Staff’, 23 May 2001. Document in author’s possession. See also Gregor Ferguson, ‘JP 129 Awaits Surveillance Report’, *Australian Defence Magazine*, March 2001, vol. 9, no. 3, pp. 33-4.

⁸⁵ Gregor Ferguson, ‘Army Blessed by White Paper’, *Australian Defence Magazine*, vol. 9, no. 3, March 2001, p. 38. On the central importance of the RMA in the White Paper see also Geoffrey Barker, ‘Defence gets a shot of realism’, *The Australian Financial Review*, 7 December 2000.

document stated, 'the most important development changing the conduct of warfare is the ability to increase vastly the speed and capacity to collect, organise, store, process, tailor and distribute information'.⁸⁶ Indeed, *Defence 2000* is peppered with statements such as 'effective use of information is at the heart of Australia's defence capability' and 'for Australia effective exploitation of information capabilities will be critical to maintaining our edge'.⁸⁷

The main characteristics of the RMA were identified in the White Paper as a trend towards the integration of military forces for joint operations; the networking of individual systems and capabilities to achieve whole-of-force effects and multiplied combat-power; and changes to military organisation and doctrine.⁸⁸ As *Defence 2000* puts it:

'RMA technologies impart the ability to know more than one's adversary in relevant areas. This can result in a decisive military advantage when linked with appropriate weapons and concepts of operation. Indeed, this will probably be one of the decisive factors in warfare over the coming decades'.⁸⁹

As foreshadowed in ASP 97 and *Defence Review 2000*, the White Paper committed Australia to the development of an advanced information-technology infrastructure based on major investment and cooperation with the United States.⁹⁰ Information technology, the document declared, could confer long-range precision strike using networked platforms employing stealth technology and electronic self-protection. Sensors would increase automation and remote control would help reduce personnel numbers.⁹¹

The White Paper announced that the early 21st century ADF would be based on a mixture of new and upgraded platforms, information and space-based capabilities. The FA/18 would be upgraded using stealth technology; new combat aircraft would be acquired in 2006-7 with the first fighters to enter service in 2012.⁹² The RAN's Anzac frigates would receive anti-ship missile defence and a new class of three air-defence capable ships would be locally built beginning in 2005-6. Armoured personnel carriers would be upgraded but the Army would also be equipped with a new armed reconnaissance helicopter and shoulder fired missiles.⁹³

Space-based technologies such as UAVs and uninhabited combat aerial vehicles (UCAVs) were identified in *Defence 2000* as emergent systems that offered a great deal of potential for surveillance, reconnaissance, information gathering and eventually the

⁸⁶ *Defence 2000*, p. 108.

⁸⁷ *Ibid.*, pp. 84; 56.

⁸⁸ *Ibid.*, p. 108.

⁸⁹ *Ibid.*, pp. 108-9.

⁹⁰ *Ibid.*, p. 109.

⁹¹ *Ibid.*, pp. 109-10.

⁹² No replacement combat fighter has been decided upon, but speculation centres around aircraft such as the F-22 Raptor and the Eurofighter as well as a possible role for the Tomahawk Land Attack Missile (TLAM). See Evans, *Australia and the Revolution in Military Affairs: The Challenge for a Middle Power*, pp. 17-18.

⁹³ See Kevan Wolfe, 'Australia's Defence White Paper – an overview', *Asia-Pacific Defence Reporter*, December/January 2001, vol. 26, no. 7, pp. 21-2.

delivery of combat power.⁹⁴ The White Paper announced that advances in biological procedures and nano-technology would be monitored in order ‘to select and acquire expertise and capability in those technologies that offer the most advantages in gaining and maintaining the knowledge edge’.⁹⁵ Advanced RMA-style technology would also be applied to improve the performance of individual soldiers. In the future, the use of micro-vehicles, night-vision equipment and sophisticated navigation techniques would assist soldiers ‘to move faster and see further, conduct operations over 24 hours in all terrains and have vastly improved firepower at his or her fingertips’.⁹⁶

To meet the demands of 21st century warfare, an organisational review of the DSTO was necessary. The organisation will ‘undertake a fundamental review of its program of work and its structures to ensure that it is poised to take best advantage of the emerging RMA, information and other technologies’.⁹⁷ The DSTO would liaise with industry in its research into software for guided-weapons combat systems, data management, signal processing and C4 systems integration.⁹⁸ Australia would also pursue a cooperative project in a major UAV program with the United States and would undertake extensive research into information operations, simulation and modelling in a series of both qualitative and quantitative wargames.⁹⁹

To facilitate the drive toward cutting-edge RMA-Knowledge Edge research, the White Paper designated Information Capabilities to be an integral part of a \$A16 billion, ten-year Defence Capability Plan (DCP) unveiled in the document. Under the DCP, Information Capabilities – comprising intelligence and surveillance, communications, information warfare, command and headquarters systems, logistics and business applications – became for the first time a separate grouping in order to ensure their strategic priority.¹⁰⁰ Between 2001 and 2011, A\$2.5b will be spent on developing Information Capabilities. Indeed, in terms of capital expenditure, information technologies now rank third in Australia’s defence-spending hierarchy – behind air combat (A\$5.3 billion) and land forces (A\$3.9 billion) – but well ahead of maritime forces (A\$1.8 billion) and strike (A\$0.8 billion).¹⁰¹

The order of these priorities demonstrates the importance the Department of Defence now assigns to information techniques in 21st century warfare. The Information Capabilities grouping includes intelligence and surveillance, communications, information operations, command and headquarters systems, logistics and business applications plus the stealth capabilities embedded in existing air platforms. According to *Defence 2000*, the objective is to apply the components of the Information Capabilities grouping to position Australia to harness RMA-style advances. In this manner, the ADF will be assured of timely, accurate and secure information to exploit individual and unit combat effectiveness.¹⁰²

⁹⁴ *Defence 2000*, pp. 109-11.

⁹⁵ *Ibid.*, p. 111.

⁹⁶ *Ibid.*, p. 111. In East Timor, Australian troops found that night-vision equipment was a key factor in gaining dominance over Indonesian-backed militia forces.

⁹⁷ *Defence 2000*, pp. 112-13.

⁹⁸ *Ibid.*, pp. 99-100.

⁹⁹ *Ibid.*, pp. 111-12.

¹⁰⁰ *Ibid.*, pp. 57; 94-5.

¹⁰¹ *Ibid.*, p. 97.

¹⁰² *Ibid.*, p. 95.

Accordingly, there is to be sustained investment in enhanced intelligence capabilities – described in the document as critical to providing a ‘war-winning edge to forces in the field’.¹⁰³ These capabilities include enhanced signal intelligence and imagery collection; improved geo-spatial information systems; and deeper levels of US-Australian cooperation in key information systems. A specific objective is to finalise a comprehensive national surveillance system to provide continuous coverage of Australia’s vast and extended northern maritime approaches. Data from the Jindalee Operational Radar Network (JORN) project, due to go into service in 2002, would eventually be fused with other sensor systems to provide an integrated 24-hour national surveillance picture.¹⁰⁴

Australia would continue to seek to use information technology to overcome its geographic size and distance. In this respect, there is to be investment to create a networked command system to support deployed forces on operations using a single collocated theatre headquarters and two deployable joint force headquarters for concurrent operations.¹⁰⁵ Finally, there are requirements to maximise integrated logistics systems for complex operations at short notice, provide protection against hostile information operations and maintain a high level interoperability with major allies.¹⁰⁶

The priority afforded to the Information Capabilities grouping has been justified in *Defence 2000* on two main grounds. First, the White Paper now clearly views RMA developments as offering Australia unique advantages in information technology that were ‘unthinkable even a few years ago’.¹⁰⁷ Second, the document believes that embracing information technology works to a national strength since Australia enjoys widespread and high levels of computer literacy. The combination of RMA information technologies and high computer literacy is seen by many Australian strategic planners as providing a societal base to ensure that ‘the “knowledge” edge . . . will be the foundation of our military capability over the coming decades’.¹⁰⁸

The Convergence Crisis and the Institutional Challenge to the Australian Knowledge Edge, 1999-2000

Although Australian defence planners expect much from the long-term benefits of the Knowledge Edge, success depends not simply on ideas and concepts but on implementation and resources. If the Knowledge Edge is to fulfil its promise, Australia must overcome a major institutional challenge to its national security: the need to fund adequately both operational commitments and future capabilities. In early 2000 the Secretary of Defence, Alan Hawke, identified ‘a convergence crisis’ stemming from the

¹⁰³ *Ibid.*, pp. 95-6.

¹⁰⁴ *Ibid.*, p. 96.

¹⁰⁵ *Ibid.*, pp. 96-7.

¹⁰⁶ *Ibid.*, pp. 95-96; 107.

¹⁰⁷ *Ibid.*, p. 94.

¹⁰⁸ *Ibid.*

combined impact of financial, management, planning and strategic pressures.¹⁰⁹ At the heart of this convergence crisis is a frozen defence budget and organisational methods that remain rooted in Cold War practice. During 1999 and 2000 the need to increase defence spending to balance the requirements of both current operations and of RMA-style investment emerged as the single greatest problem facing Australian defence planners.

In 1999 and 2000, at the very time the Office of the Revolution in Military Affairs was being established and the Knowledge Edge concept was being developed, Australia fell into the most serious defence budget crisis since the late 1930s. The budget crisis in the Defence Department was exacerbated by cost blowouts – notably in the ADF's submarine program – which were associated with poor management practices.¹¹⁰

The convergence crisis within the ADO had the effect of focusing political attention on future military capabilities. In turn, the rise of political concern over defence matters highlighted a division within the Howard Government's National Security Committee (NSC) of the Cabinet over the expenditure required to reequip the ADF for the early 21st century. In December 2000, the White Paper's Defence Capability Plan attempted to resolve the funding crisis in order to allow the ADF to move towards attaining the goal of a Knowledge Edge.

'The Coming Train Smash': The Dilemma of Low Defence Spending

In 1984 Australia was spending 2.9 per cent of GDP on defence. By 1999 the figure had dropped to 1.8 per cent (A\$11.2 billion) – the lowest percentage since 1938 – representing a drop of 35 per cent over fifteen years.¹¹¹ By early 2000, there appeared to be an unresolved tension at the heart of Australian defence policy between a desire for advanced technology and a need for a credible force-in-being for operations in the immediate Asia-Pacific region.¹¹² It became clear that, unless the defence budget was substantially increased, the ADO would not be able to undertake even a modest, 'middle way' RMA and simultaneously retain high preparedness for current regional contingencies such as the peace enforcement mission in East Timor.¹¹³ In 1999, the leading Australian strategic analyst, Paul Dibb, predicted a 'coming train smash' in Australian defence policy. A collision between ends and means would occur because the Government's ambition to invest in information-age capabilities was unmatched by increased defence spending. Dibb argued that the purchase of new systems and platforms

¹⁰⁹ Department of Defence, 'Money Matters', Paper based on an Address to the Royal United Services Institute for Defence Studies of Victoria by Dr Allan Hawke, Secretary of the Department of Defence, 27 April 2000, pp. 1-3 (henceforth cited as Hawke, 'Money Matters'). Document in author's possession.

¹¹⁰ As an example of the fiscal crisis the cost of the Collins submarine project had blown out from A\$6 billion to A\$7.5 billion. See Department of Defence, *Report to the Minister for Defence on the Collins Class Submarine and Related Matters*, Commonwealth of Australia, Canberra, June 1999, chaps 2, 4 and 8.

¹¹¹ For details of Australian defence expenditure see Derek Woolner, *Affordable Self Reliance?: Past Patterns in Defence Finance and Prospects after the 1994 White Paper*, Research Paper No. 16, Parliamentary Research Service, Canberra, December 1994, pp. 1-23 and 'The Revolution in Military Affairs and the Australian Defence Force: A Public Discussion Paper', pp. 5-8.

¹¹² Derek Woolner, *Pressures on Defence Policy: The Defence Budget Crisis*, Research Paper No. 20, Foreign Affairs, Defence and Trade Group, Parliament of Australia, Canberra, April 2000, pp. 3-11.

¹¹³ Evans, 'The Middle Way: Australia's Response to the Revolution in Military Affairs', pp. 14-15 and *Australia and the Revolution in Military Affairs: The Challenge for a Middle Power*, pp. 15-20.

along with expenditure on upgrades, enhancements, refits and operational deployments could not be met from within a static defence budget.¹¹⁴

During 2000 defence spending became an acute political issue. In April, Dr Hawke stated bluntly, 'the bottom line is that Australia can no longer afford a balanced, self-reliant, capable, and ready defence force of 50,000 with its current capabilities on 1.8% of GDP'.¹¹⁵ The Secretary pointed out the nature of the *fin de siècle* convergence crisis:

The irony of our professional military performance in East Timor is that it masks the reality we face. *Australia's national security is challenged by a convergence of financial, management, planning and strategic pressures.* The Australian Defence Organisation's ability to present a range of capability and military response options to Government will be severely constrained if these combined pressures are left unchecked. This crisis, which has been building over the last [post-Cold War] decade, has now come to a head due to increased personnel costs and the costs of expanding and re-equipping the capabilities of the ADF.¹¹⁶

The weakness of the defence budget was exacerbated by the problem of unreformed Cold War organisational and managerial practices. Hawke remarked that the Department of Defence had undergone 'more reviews than *Gone With the Wind* and [had become] a lucrative hunting ground for consultants'.¹¹⁷ In the relatively predictable strategic environment of the later Cold War – when short-notice ADF operational deployments were rare – the ADO had developed the unhealthy practice of holding down operations and personnel budgets in order to fund capability and platform modernisation.¹¹⁸ In the more unpredictable conditions of the post-Cold War era – when ADF operational deployments increased markedly – this approach to managing capital equipment and projects proved to be untenable. By the late 1990s the needs of capability development and short-notice military deployments could not be met simply by scaling back spending on operational needs and personnel.¹¹⁹

By 2000 there was not enough money available to meet the triple demands of technology upgrades to existing platforms, the purchase of new platforms, and acquiring RMA-Knowledge Edge systems. With a defence expenditure base of 1.8 per cent of GDP, the possibility of Australia developing both advanced high-technology military capabilities while maintaining a credible ADF for current contingencies seemed rather bleak. As Dr

¹¹⁴ See Paul Dibb's views as quoted in *The Australian*, 19 September 2000. Of A\$11.2 billion, \$6.52 billion was spent on current capability, \$3.3 billion on future capability, \$220 million on research, \$840 million on personnel services and \$375 million on resource administration, *Defence Review 2000*, p. 51.

¹¹⁵ Hawke, 'Money Matters', p. 3.

¹¹⁶ *Ibid.*, p. 2. Emphasis added.

¹¹⁷ Quoted in Eric Andrews, *The Department of Defence, The Australian Centenary History of Defence*, vol.V, Oxford University Press, Melbourne, 2001, p. 296.

¹¹⁸ Woolner, *Pressures on Defence Policy: The Defence Budget Crisis*, pp. 3-12. In 1985 the Australian Defence Organisation consisted of 70,000 uniformed personnel and 40,000 civilians. By 2000, these numbers had fallen to 50,000 and 16,000 respectively, *The Australian*, 23 February 2000.

¹¹⁹ Hawke, 'Money Matters', pp. 4-5; Evans, *Australia and the Revolution in Military Affairs: Challenge for a Middle Power*, pp. 15-18. In the decade between 1990 and 2000 there were twenty-two ADF deployments including large-scale operations in Somalia and East Timor, *Asia-Pacific Defence Reporter*, February 2001, p. 29.

Hawke put it, 'at present and anticipated levels of funding, the ADF as we know it today will cease to exist'.¹²⁰

The Politics of Defence: The 'Hi-End-Low-End' Division of 2000

The budget crisis in the Australian Defence Organisation was not easily resolved. During 2000, defence spending and the problem of unreformed managerial practice became the focus of a political debate in the National Security Committee of the Howard Government.¹²¹ Division developed over whether Australia required a 'high-end' (shorthand for an expensive, high-technology) or a 'low-end' (shorthand for a cheaper, lower-technology) military establishment. As one defence correspondent, Robert Garran, observed succinctly, 'at the heart of the debate [in the Howard Government] is whether the Australian Defence Force should focus on peacekeeping and low-level contingencies in the region or whether it needs a powerful high-tech capability'.¹²²

According to various press reports, those who supported a high-end force included John Moore, the Minister for Defence and Alexander Downer, the Foreign Minister. Sceptics of the high-end force were reported to include the Treasurer, Peter Costello; the Finance Minister, John Fahey; and the influential Secretary of the Department of the Prime Minister and Cabinet, Max Moore-Wilton.¹²³ The national daily newspaper, *The Australian*, recorded the progress of this complex, internal political debate.¹²⁴ In a series of editorials and opinion pieces, the newspaper warned against the idea that the East Timor peace enforcement experience could serve as a model for Australia's future military force structure. In January 2000, in an editorial on the implications of the RMA for Australia, *The Australian* stated 'for "revolution in military affairs" read "information revolution" . . . the attempts by the military . . . to deliver the capability of destroying targets with unparalleled precision'. To exploit the RMA, Australia required a clear strategic approach in order to permit the ADF to 'determine the best mix of [information] technologies'.¹²⁵

In August 2000, those favoring a low-end force and restricted defence spending in the National Security Committee of the Cabinet appeared to score a major victory when the Government reduced the number of AEWCs wanted by the RAAF from seven to four aircraft. It was noted that Australia's East Timor deployment was expected to cost over \$4 billion in the period from 1999 to 2003. One low-end advocate in the cabinet was reported as prefacing his opposition to advanced warning aircraft by asking rhetorically of Defence officials: 'What use would AEWCs have been in Timor?'.¹²⁶ In September 2000, in yet another hardline editorial, *The Australian* warned the Government that, 'the capability to defend ourselves should be paramount in Cabinet thinking. It would be a

¹²⁰ 'Hawke, 'Money Matters', p. 10. See also Woolner, *Pressures on Defence Policy: The Defence Budget Crisis*, pp. 19-25.

¹²¹ For a useful overview see Graeme Dobell, 'The Politics of the White Paper', *Australian Defence Force Journal*, no. 147, March/April 2001, pp. 31-3.

¹²² Robert Garran, 'Defence Splits Cabinet', *The Australian*, 19 September 2000.

¹²³ *Ibid.*

¹²⁴ See especially, Paul Kelly, 'All quiet on the spending front', *The Australian*, 23 February 2000.

¹²⁵ 'Revolution Raises Policy Questions', *The Australian*, 4 January 2000, editorial.

¹²⁶ Robert Garran, 'Defence's Strategy for Survival', *The Australian*, 10 October 2000.

national disgrace – as well as irresponsible – to argue that we can ignore the need to sustain capable military forces’.¹²⁷

The White Paper's Defence Capability Plan: Future Implications for an Australian RMA-Knowledge Edge

By the end of 2000, it was clear that, despite tactical reverses over AEWC capabilities, the advocates of a high-end ADF had prevailed in the political debate over defence spending in the National Security Committee of the Cabinet. In its December 2000 White Paper, the Howard Government sought to provide a long-term resolution to the convergence crisis. The political aim was to balance strategic demands, defence capabilities and levels of defence funding by introducing the ten-year Defence Capability Plan (DCP).¹²⁸ The DCP – with as already noted, a strong emphasis on the RMA-Knowledge Edge – was unveiled as the cornerstone of *Defence 2000*.

The aim of the DCP was to establish parameters against which defence spending could be increased by an average of about 3 per cent per annum in real terms between 2001 and 2011.¹²⁹ Significantly, Prime Minister Howard declared *Defence 2000* to be the ‘most comprehensive reappraisal of Australian defence *capability* for decades’.¹³⁰ The victory of the Government’s high-enders was captured by *The Australian*’s banner headline on the White Paper: ‘Enter the cyber warriors’.¹³¹

Under *Defence 2000*’s 10-year capability plan, the Australian defence budget is to increase by A\$500 million between 2000 and 2001; by A\$1 billion between 2002 and 2003; and thereafter by 3 per cent real growth per year until 2010. Some sources estimate that there will be an A\$23.5 billion increase in expenditure in real terms over the first decade of the 21st century. In theory, by 2010, defence spending will stand at A\$16 billion as opposed to A\$11.2 billion in 2000.¹³² Paul Dibb has suggested that the firm financial commitment under the DCP has made the new strategic blueprint ‘a benchmark Defence White Paper’.¹³³

It is important, however, to note that the DCP remains an unbinding commitment on future Australian governments. For this reason, some observers are pessimistic about the future of a high-technology ADF with a Knowledge Edge capability. As Greg Sheridan, the foreign editor of *The Australian*, has observed, real cause for concern with the DCP is that ‘no government has ever sustained a real increase of 3 per cent in defence spending for 10 years’.¹³⁴ In Sheridan’s view, ‘the Government’s White Paper is all about Australia’s strategic decline. It’s about managing, slowing, but above all accommodating,

¹²⁷ ‘Defence Lacks Coherent Strategic Lead’, *The Australian*, 21 September 2000, editorial.

¹²⁸ *Defence 2000*, pp. vii; 6.

¹²⁹ *Ibid.*, p. 117.

¹³⁰ Statement by Prime Minister John Howard, *The Sydney Morning Herald*, 7 December 2000.

¹³¹ *The Australian*, 7 December 2000.

¹³² See Wolfe, ‘Australia’s Defence White Paper – an overview’, pp. 22-4.

¹³³ Paul Dibb, ‘Defence Paper is Evolutionary’, *Australian Financial Review*, 7 December 2000 and ‘Australia’s Best Defence White Paper?’, *Australian Defence Force Journal*, no. 147, March/April 2001, pp. 27-8.

¹³⁴ Greg Sheridan, ‘New equipment aside, post-coital blues are inevitable’, *The Australian*, 1 December 2000.

our national strategic decline'.¹³⁵ Only time will tell whether optimists like Dibb, or pessimists like Sheridan, are right.

Conclusion

In his masterly 1961 essay, *Science and Government*, the British scholar C. P. Snow wrote that, for official technological research to succeed in Western democracies, three important conditions must always be met. First the objective of scientific research must be both clear and 'not too grandiloquently vast'.¹³⁶ Second, there must be a research committee or organisation that is strategically placed within the bureaucracy to interact with key policy-makers throughout the 'great underground domain of science and government'. Third, the committee or research organisation concerned must be armed with powers of action, inspection and follow-up.¹³⁷

So far, the Australian RMA-Knowledge Edge initiative has fulfilled the first two of Snow's three conditions. As Dr Ian Chessell, the Chief Defence Scientist, observed recently, the purpose of the Knowledge Edge must be to keep abreast of appropriate and relevant RMA technologies and integrate them into the ADF's combat systems.¹³⁸ Such an ambition is both clear and 'not too grandiloquently vast'. Second, the Office of the RMA is located inside the Military Strategy Branch – the very heart of ADF Headquarters – and the organisation is thus well-positioned to coordinate the ADO's activities on future warfare research. Snow's third condition – that of action, inspection and follow-up – exists so far only in the Australian world of information age theory. It is probable however, that as evidentiary methods of practice emerge over time, Australia's Knowledge Edge organisation – in conjunction with the DSTO – will gain increasing influence over capability decision-making.

Although much has been written recently about the Department of Defence's capacity to balance its budget, management practices and operational commitments, it is worth noting the vital importance of nurturing a 'learning organisation'.¹³⁹ Based on historical precedents, the evidentiary demands of the Knowledge Edge will probably require, more than any other factor, a strong intellectual investment in strategic analysts.¹⁴⁰ Despite Australia's advances in RMA theorising – which are arguably second in the world only to those of the United States – there is a growing shortage of a new generation of younger strategic thinkers. Less and less of the cream of Australia's university graduates are

¹³⁵ Greg Sheridan, 'Chronicle of strategic decline', *The Australian*, 7 December 2000.

¹³⁶ C. P. Snow, *Science and Government; The Godkin Lectures at Harvard University*, 1960, Oxford University Press, London, 1961, pp. 74-5.

¹³⁷ *Ibid.*

¹³⁸ Interview with Dr Ian Chessell, Chief Defence Scientist, *Australian Defence Magazine*, May 2001, vol. 9, no. 5, pp. 37-8.

¹³⁹ See Emily O. Goldman, 'Thinking About Strategy Absent the Enemy', *Security Studies*, Autumn 1994, vol. 4, no. 1, pp. 40-85; 'The US Military in Uncertain Times: Organisations, Ambiguity and Strategic Adjustment', *The Journal of Strategic Studies*, June 1997, vol. 20, no. 2, pp. 31-74 and Michael Evans, 'Fabrizio's Choice: Organisational Change and the Revolution in Military Affairs Debate', *National Security Studies Quarterly*, Winter 2001, vol. vii, issue 1, pp. 1-25.

¹⁴⁰ For comparative historical analyses of military innovation see Emily O. Goldman and Richard B. Andres, 'Systemic Effects of Military Innovation and Diffusion', *Security Studies*, Summer 1999, vol. 8, no. 4, pp. 79-125.

choosing to study strategy and international relations.¹⁴¹ Over the long term, the shortage of highly-educated strategic specialists will make itself felt in Australian analysis of RMA developments – particularly in the crucial task of integrating policy with operations, systems and technology.

A partial solution to the shortage of analysts, is the creation by the ADF of a Joint School of Advanced Warfighting (JSAW) on the US Marine Corps model. Such a school would produce specialised ‘knowledge officers’ and help to reinforce the linkages between the worlds of policy, military theory and operational practice. It must be recognised that, in generating a practical transition strategy from the world of RMA theory to the world of RMA practice, Australia will need a strong civil-military cadre of highly educated planning experts to sustain Project Sphinx and the Knowledge Edge in the future.

Finally, it is important to note that Australia’s institutional embrace of an RMA initiative is less than five years old. In the face of conditions of financial stringency, much of value has been achieved in that short period. Indeed, the creation of an RMA organisation to analyse the implications of information-age warfare has been one the least understood, but nevertheless one of the most significant achievements of the Howard Government. Despite the old adage that it is always easier to design the future than to predict it, the development of the Knowledge Edge program represents a major step towards the goal of transforming Australia’s defence strategy to meet 21st century conditions. The Australian RMA initiative has moved from an informal, service-driven debate about ‘knowledge dominance’ in 1996 through to the official formulation of the Knowledge Edge between 1997 and 1999, to the emergence of a special Knowledge Edge Information Capabilities group in the December 2000 Defence White Paper. The designation of Information Capabilities as a separate capability grouping – with more funding than that assigned to improving current strategic strike – is perhaps the most fundamental indication of how Australia has come to view the Knowledge Edge as the foundation stone of its military capability in the 21st century.

Technology is a crucial agent of change in any culture of modernity but it never operates in a pristine setting. The Australian approach to the RMA, demonstrates how technological factors are conditioned by a nation’s institutional values and by its political and strategic context. Ultimately, Australia’s search for a Knowledge Edge may yield broad lessons that are applicable to other middle powers that choose to pursue military modernisation within the parameters of limited financial budgets. This process may help illuminate a key intellectual problem of the information age: how new strategic theory is articulated by a professional community, and how, questions of technology are nearly always mediated by a combination of policy, resources and operational expertise.

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¹⁴¹ For a discussion see Paul Dibb, ‘The Evolution and Future of Australian Defence Policy’, in Coral Bell, ed, *Nation, Region and Context: Studies in Peace and War in Honour of Professor T. B. Millar*, Canberra Papers on Strategy and Defence No. 112, Strategic and Defence Studies Centre, 1995, pp. 47-8 and ‘A Trivial Strategic Age’, *Quadrant*, July-August 200, pp. 11-17.